Augmented Reality Development Environment for Electronic Procedure systems (AREEPS)

Completed Technology Project (2016 - 2017)

Project Introduction

The Evolvable Mars Campaign (EMC) has identified technology needs for Autonomous Crew Operations. Augmented Reality (AR) is part of the solution to enable crew autonomy and coordinated surface and crew operations of vehicle or habitat at destinations with > 6 second time delay to ground. areas. For an effective and sustainable operations, an integrated development for augmented reality must be available for the ops team to create and manage AR content quickly and easily. Goal is to investigate the feasibility to develop an Augmented Reality Environment for electronic procedure Systems (AREEPS). Augmented Reality (AR) is part of solution to support crew autonomy and surface operations at destinations with > 6 second time delay to ground for an effective and sustainable operations, an integrated development for augmented reality must be available for the ops team to create and manage AR content quickly and easily. Goal is to investigate the feasibility to develop an Augmented Reality Environment for electronic procedure Systems (AREEP) that includes authoring environment that enables users to embed AR steps within procedures execution environment that mix traditional and AR steps within a web based user interface for overall procedure execution and monitoring.

Anticipated Benefits

The envisioned integrated development environment combines an authoring environment that enable the user to embed augmented reality steps within an electronic procedure, as well as an execution environment that can mix traditional and AR based steps within a web based user interface for overall procedure execution and monitoring. The use of the execution environment will provide overlaying of the context sensitive instruction or graphical cues on the target systems when looking at the system. Lack of an integrated development environment to support the complex software development effort (Bottleneck that hampers practical use of AR) procedures are meant to be tailored based on the situation flight operation community requires procedures updates within hours current technology still requires multiple weeks to develop an AR system. Significant impact to increase ISS utilization and closing the gaps to support missions beyond LEO.

Augmented Reality Development Environment for Electronic Procedure systems

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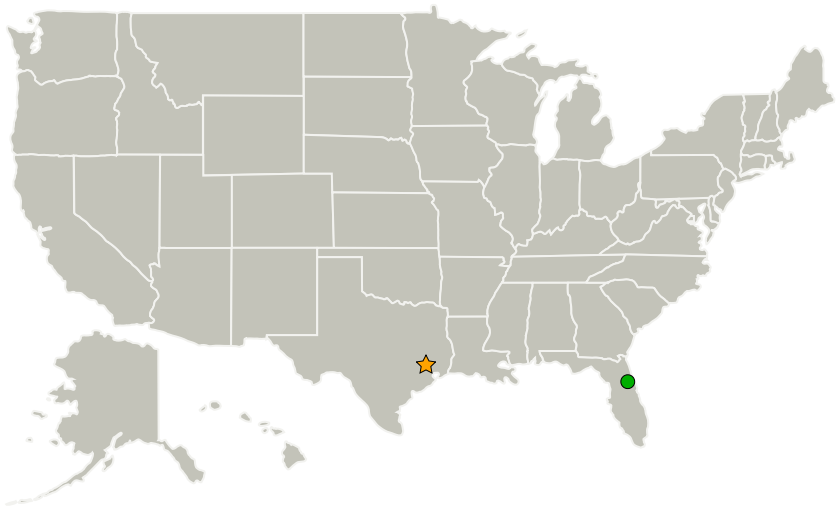
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Columbia University in the City of New York	Supporting Organization	Academia	New York, New York
●Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Project Transitions

October 2016: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

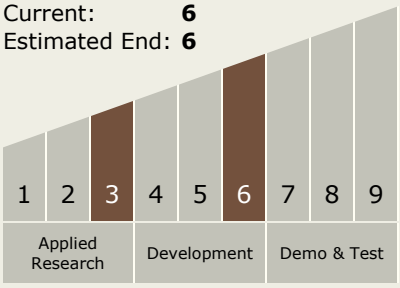
Carlos H Westhelle

Principal Investigator:

Lui Wang

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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July 2017: Closed out

Closeout Summary: Upon project completion, the integrated development suit e of tools (AREEPS), will provide the critical technologies needed to develop an e nd to end Augmented Reality systems, as well as execute these within the conte xt of NASA Exploration beyond Low Earth Orbit.The outcomes of this project wer e

- Extended the Procedure Representation Language (PRL), developed by JSC, with additional AR and autonomous mentoring instructions.
- Developed AREEPS software architecture & prototype with increasing fidelity to validate the concepts of operations

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.6 Human Systems Integration
    - TX06.6.1 Human Factors Engineering

Target Destinations

Earth, The Moon, Mars

Supported Mission Type

Projected Mission (Pull)